M&V Planning Tool

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Goals

1. To provide a framework that would help in the development of the measurement & verification (M&V) plans by introducing M&V specific issues at an early project development stage.
2. Keep the framework as simple as possible to increase its usability.
3. Provide users of the FEMP M&V Guidelines, version 2.2, a simple, flexible, and customizable framework to introduce key M&V topics at an early stage of a project.

Organization

There are three parts to the M&V Planning Tool:

1. M&V Planning Instructions - A Word document providing an overview of the tool and instructions on how to use it.
2. M&V Considerations Matrix - List of sample objectives and constraints that need to be developed and discussed during the project development stage (in Powerpoint format).
3. M&V Planning Flow Chart - A conceptual flow chart capturing the development process for an M&V plan (in Powerpoint format)

Introduction

The M&V Planning flow chart is an iterative exercise that requires the development of a custom list of objectives and constraints that relate to measurement and verification of savings. The user must start with both project level and ECM specific objectives and constraints, and one has to frequently switch between project level and individual ECMs during the evaluation process.

How to develop an M&V Plan

The steps described below correspond to the step numbers on the flow chart.

Step 1: Develop a list of project and ECM level objectives and constraints that relate to measurement and verification of savings.

Some typical objectives and constraints for M&V are listed below. A custom list should be developed for the specific project based on key topics that will affect the M&V plan for the project and/or ECMs.

Typical Objectives

- Desire to track energy savings through utility metering,
- Desire to Verify Energy Performance Continuously,

- Desire to Verify Energy Performance Annually,
- Track Post-Retrofit Consumption and Adjust Baseline for Changes
- Maximize Infrastructure by using Least-Cost M&V Option.

Typical Constraints

- Historical Utility Data not Available,
- Lack of Dedicated Utility Meters,
- High Degree of Interaction between ECMs
- ECMs Scope Affects a Very Small Portion of Overall Utility Baseline

It is appropriate to include objectives and constraints that may apply, but enough information is not yet available. A priority (High, Medium, or Low) can be assigned to each Objective & Constraint identified to help with the evaluation. High priority Objectives and Constraints have the strongest influence on M&V selection and should be considered most imperative in the evaluation.

Step 2: Evaluate project and ECM level objectives and constraints to identify the most appropriate M&V Option. Determine if a single M&V Option can be used and is desirable for the entire project or if a more custom M&V approach is required for the proposed set of ECMs.

Select an M&V Option for evaluation (Options A, B, C, or D).

If one of the project level objectives or constraints is not met, select another M&V Option for evaluation. If none of the M&V Options can satisfy project level objectives and constraints, select an appropriate M&V Option for the first ECM.

Step 3: Evaluate the savings risk associated with the selected M&V Option/s.

To perform this exercise, a custom list of risk elements should be developed based on project and ECM specifics. See Responsibility Matrix from FEMP M&V Guidelines for a compete discussion of risk elements.

Typical Risk Elements

- Operating Hours
- Environmental/Process Loads
- Degradation of savings
- Weather
- Building Occupancy
- Major Changes to the Facilities
- Savings Risk Associated with the Performance of O&M, Repair & Replacement

Step 4: If one M&V Option has been selected for all ECMs, estimate the cost of using this M&V Option in relation to savings risks. If a custom approach is being followed for individual ECMs, repeat Steps 3 and 4 for each ECM until an M&V Option has been associated with each ECM. Then, estimate the cost of using the selected M&V Options

Do the M&V requirements and the savings risk justify the M&V expenses? If not, return to Step 2.

Step 5: If all the M&V requirements are met and the savings risk justify the M&V expenses, proceed with the development of the M&V plan for the project.

M&V Considerations Matrix

Objective or Constraint	ECM or Project Level	Project Specific Objectives and Constraints (list the ones that directly affect the M&V approach for the project)	Specific Performance Measurement Approach	Utility Bills Comparison Approach	Calibrated Simulation Approach
Objective	Project	Ensure equipment performance for life of contract	X		
Objective	Project	Maximize infrastructure improvement by implementing the most cost-effective M&V option	X		
Constraint	Project	Existing utility infrastructure lends itself to tracking savings		X	
Constraint	Project	Historical utility data pertinent to project scope is available		X	
Objective	Project	Track and Adjust Baseline for future changes in weather, occupancy, mission, etc.		X	X
Constraint	Project	Potential ECMs will not have high interaction	X		
Objective	Project	Want to track energy Savings at Utility meter(s)		X	
Objective	Project	Verify energy performance periodically	X		X
Objective or Constraint	**ECM or Project Level**	**ECM Specific Objectives and Constraints (list the ones that directly affect the M&V approach for the project)**	**Specific Performance Measurement Approach**	**Utility Bills Comparison Approach**	**Calibrated Simulation Approach**
Objective	HVAC	Ensure long-term equipment performance	X		
Objective	HVAC	Ensure savings for the duration of the contract (persistence)	X	X	
Objective	Lighting	Quantify savings through measurements	X	X	
Objective	Lighting	Maintain lighting levels	X		
Objective	Windows	Quantify savings from ECM			X
Constraint	Windows	High interactive affects		X	X
Constraint	HVAC	No building level utility data is available	X		X

M&V Planning Flowchart